CLAIMS

1. Method for producing a workpiece, and in particular a plate, of steel which is resistant to abrasion and whose chemical composition comprises, by weight:

$$0.1\% \le C < 0.23\%$$
 $0\% \le Si \le 2\%$
 $0\% \le Al \le 2\%$
 $0.5\% \le Si + Al \le 2\%$
 $0.5\% \le Si + Al \le 2\%$
 $0\% \le Mn \le 2.5\%$
 $0\% \le Ni \le 5\%$
 $0\% \le Cr \le 5\%$
 $0\% \le Mo \le 1\%$
 $0\% \le W \le 2\%$
 $0.05\% \le Mo + W/2 \le 1\%$
 $0\% \le B \le 0.02\%$
 $0\% \le Ti \le 0.67\%$
 $0\% \le Zr \le 1.34\%$
 $0.05\% < Ti + Zr/2 \le 0.67\%$
 $0\% \le S \le 0.15\%$
 $N < 0.03\%$

- optionally from 0% to 1.5% of copper,
- optionally at least one element selected from Nb, Ta and V at contents such that Nb/2 + Ta/4 + V \leq 0.5%,
- optionally at least one element selected from Se, Te, Ca, Bi and Pb at contents which are less than or equal to 0.1%, the balance being iron and impurities resulting from the production operation, the chemical composition further complying with the following relationships:

$$C^* = C - Ti/4 - Zr/8 + 7xN/8 > 0.095$$
%

and:

$$Ti + Zr/2 - 7xN/2 > 0.05$$
%

and:

$$1.05xMn + 0.54xNi + 0.50xCr + 0.3x(Mo + W/2)^{1/2} + K > 1.8$$

with: K = 1 if B > 0.0005% and K = 0 if B < 0.0005%,

according to which the plate is subjected to a thermal quenching processing operation which is carried out in the heat for forming in the hot state and, for example rolling heat, or after austenitization by means of reheating in a furnace, in order to carry out the quenching:

- the workpiece or plate is cooled at a mean cooling rate greater than $0.5\,^{\circ}\text{C/s}$ between a temperature greater than AC_3 and a temperature of from approximately T=800-270xC*-90xMn-37xNi-70XCr-83x(Mo+W/2) to $T\text{-}50\,^{\circ}\text{C}$,
- the workpiece or plate is then cooled at a mean core cooling rate $Vr < 1150 \mathrm{xep}^{-1.7}$ greater than 0.1°C/s between the temperature T and 100°C, ep being the thickness of the plate expressed in mm,
- the workpiece or plate is cooled as far as ambient temperature and optionally planishing is carried out.
- 2. Method according to claim 1, further characterized in that: $1.05 x Mn + 0.54 x Ni + 0.50 x Cr + 0.3 x (Mo + W/2)^{1/2} + K > 2.$
- 3. Method according to claim 1 or claim 2, further characterized in that:

C ≤ 0.22%

and:

 $C* \ge 0.12%$.

4. Method according to any one of claims 1 to 3, further characterized in that:

 $Ti + Zr/2 \ge 0.10$ %.

5. Method according to any one of claims 1 to 4, further characterized in that:

Si + Al
$$\geq$$
 0.7%.

- 6. Method according to any one of claims 1 to 5, characterized in that tempering at a temperature which is less than or equal to 350°C is further carried out.
- 7. Method according to any one of claims 1 to 6, characterized in that, in order to add titanium to the steel, the liquid steel is placed in contact with a slag containing titanium and the titanium of the slag is caused to diffuse slowly in the liquid steel.
- 8. Workpiece, and in particular a plate, of steel which is resistant to abrasion and whose chemical composition comprises, by weight:

$$0.1\% \le C < 0.23\%$$
 $0\% \le Si \le 2\%$
 $0\% \le Al \le 2\%$
 $0.5\% \le Si + Al \le 2\%$
 $0.5\% \le Mn \le 2.5\%$
 $0\% \le Mi \le 5\%$
 $0\% \le Cr \le 5\%$
 $0\% \le Mo \le 1\%$
 $0\% \le W \le 2\%$
 $0.05\% \le Mo + W/2 \le 1\%$
 $0\% \le B \le 0.02\%$
 $0\% \le Ti \le 0.67\%$
 $0\% \le Zr \le 1.34\%$
 $0.05\% < Ti + Zr/2 \le 0.67\%$
 $0\% \le S \le 0.15\%$

N < 0.03%

- optionally from 0% to 1.5% of copper,
- optionally at least one element selected from Nb, Ta and V at contents such that Nb/2 + Ta/4 + V \leq 0.5%,
- optionally at least one element selected from Se, Te, Ca, Bi and Pb at contents which are less than or equal to 0.1%, the balance being iron and impurities resulting from the production operation, the chemical composition further complying with the following relationships:

$$C - Ti/4 - Zr/8 + 7xN/8 > 0.095$$
%

and:

$$Ti + Zr/2 - 7xN/2 > 0.05$$
%

and

 $1.05xMn + 0.54xNi + 0.50xCr + 0.3x(Mo + W/2)^{1/2} + K$ > 1.8

with: K=1 if $B\geq 0.0005\%$ and K=0 if B<0.0005%, the steel having a martensitic or martensitic/bainitic structure, the structure containing carbides and from 5% to 20% of retained austenite.

- 9. Workpiece according to claim 8, characterized in that: $1.05 \text{xMn} + 0.54 \text{xNi} + 0.50 \text{xCr} + 0.3 \text{x} (\text{Mo} + \text{W/2})^{1/2} + \text{K} > 2.$
- 10. Workpiece according to claim 8 or claim 9, characterized in that:

and:

$$C - Ti/4 - Zr/8 + 7xN/8 \ge 0.12$$
%.

11. Workpiece according to any one of claims 8 to 10, characterized in that:

$$Ti + Zr/2 \ge 0.10\%$$
.

12. Workpiece according to any one of claims 8 to 11, characterized in that:

Si + Al \geq 0.7%.

13. Workpiece according to any one of claims 8 to 12, characterized in that the thickness of the plate is from 2mm to 150mm.